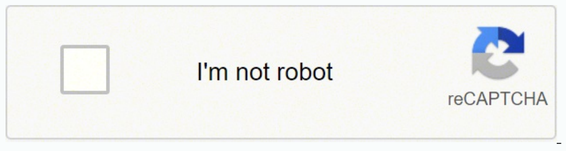

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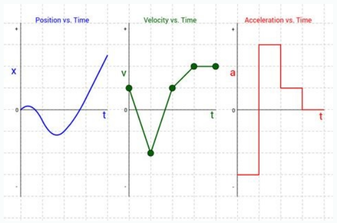
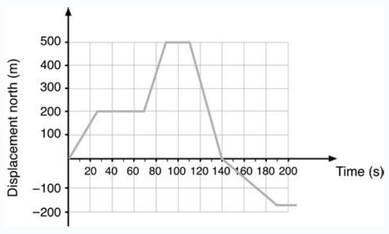
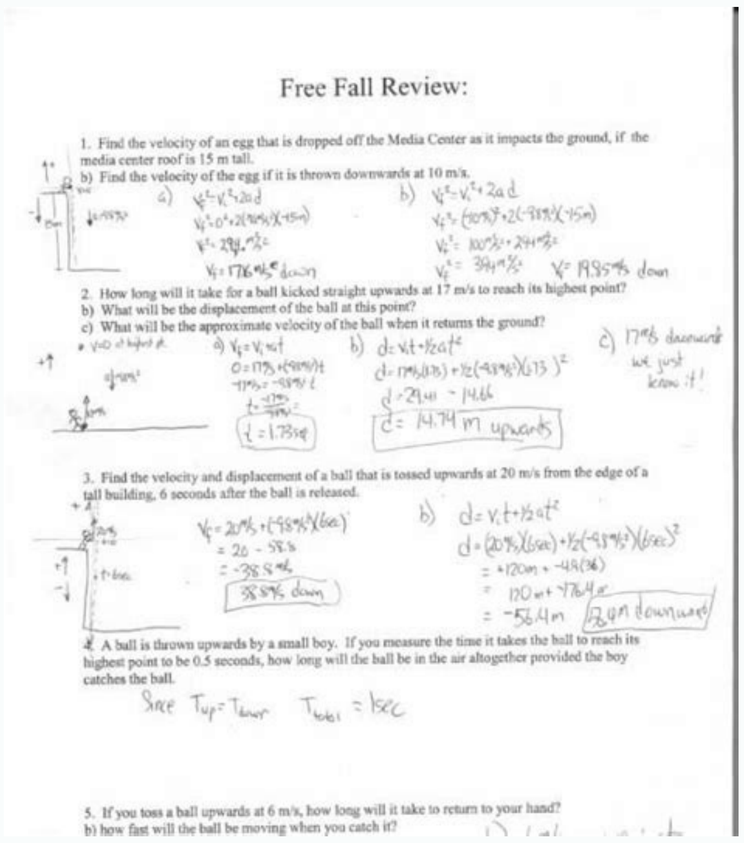
Kinematics acceleration worksheet







Free Fall Review:

1. Find the velocity of an egg that is dropped off the Media Center as it impacts the ground, if the media center roof is 15 m tall.
b) Find the velocity of the egg if it is thrown downwards at 10 m/s.

a) $v_f^2 = v_i^2 + 2ad$
$v_f^2 = 0^2 + 2(9.8\,m/s^2)(-15m)$
$v_f^2 = 294\,m^2/s^2$
$v_f = 17.15\,m/s$ down

b) $v_f^2 = v_i^2 + 2ad$
$v_f^2 = (10\,m/s)^2 + 2(-9.8\,m/s^2)(-15m)$
$v_f^2 = 100\,m^2/s^2 + 294\,m^2/s^2$
$v_f^2 = 394\,m^2/s^2$ $v_f = 19.85\,m/s$ down

2. How long will it take for a ball kicked straight upwards at 17 m/s to reach its highest point?
b) What will be the displacement of the ball at this point?
c) What will be the approximate velocity of the ball when it returns the ground?

a) $v_f = v_i + at$
$0 = 17\,m/s + (-9.8\,m/s^2)t$
$-17\,m/s = -9.8\,m/s^2\,t$
$t = 1.73\,s$

b) $d = v_i t + \frac{1}{2}at^2$
$d = 17\,m/s(1.73) + \frac{1}{2}(-9.8\,m/s^2)(1.73)^2$
$d = 29.41 - 14.66$
$d = 14.74\,m$ upwards

c) 17 m/s downward we just know it!

3. Find the velocity and displacement of a ball that is tossed upwards at 20 m/s from the edge of a tall building, 6 seconds after the ball is released.

$v_f = 20\,m/s + (-9.8\,m/s^2)(6s)$
$= 20 - 58.8$
$= -38.8\,m/s$
38.8 m/s down

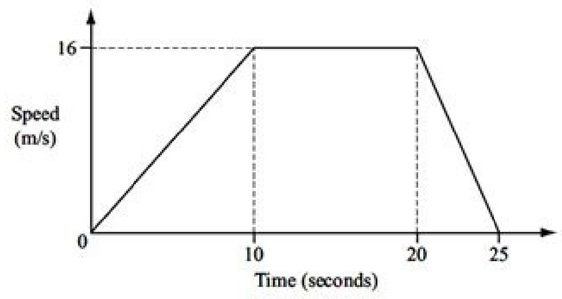
b) $d = v_i t + \frac{1}{2}at^2$
$d = (20\,m/s)(6sec) + \frac{1}{2}(-9.8\,m/s^2)(6sec)^2$
$= +120m + -48(36)$
$= 120m + 176.4m$
$= -56.4m$ 56.4m downward

4. A ball is thrown upwards by a small boy. If you measure the time it takes the ball to reach its highest point to be 0.5 seconds, how long will the ball be in the air altogether provided the boy catches the ball.

Since $T_{up} = T_{down}$ $T_{total} = 1sec$

5. If you toss a ball upwards at 6 m/s, how long will it take to return to your hand?
b) how fast will the ball be moving when you catch it?

The diagram shows the speed-time graph for a car travelling between two sets of traffic lights.



(i) Calculate the deceleration of the car for the last 5 seconds of the journey.

Answer(c)(i) ..... m/s² [1]

(ii) Calculate the average speed of the car between the two sets of traffic lights.

Answer(c)(ii) ..... m/s [4]

Worksheet: Motion Problems Name *KEY*

1. A car with a velocity of 22 m/s is accelerated uniformly at the rate of 1.6 m/s² for 6.8 s. What is its final velocity?

$$v_f = v_i + at = 22\,\tfrac{m}{s} + (1.6\,\tfrac{m}{s^2} \times 6.8\,s) = \boxed{33\,\tfrac{m}{s}}$$

2. Light travels in a straight line at a constant speed of 3.0×10^8 m/s for 4.1 years to reach the earth from the nearest star 3.9×10^{13} km away. What is its acceleration?

To be answered in Episode 303

3. A boy sliding down a hill accelerates at 1.40 m/s². If he started from rest, in what distance would he reach a velocity of 7.00 m/s?

$$v_f^2 = 2ad$$
$$d = \frac{v_f^2}{2a} = \frac{(7.00\,\tfrac{m}{s})^2}{2 \times 1.40\,\tfrac{m}{s^2}} = \boxed{17.5\,m}$$

4. What is the acceleration of a plane that changes velocity from 75 m/s to 140 m/s in 15s? How far does a plane fly during that time?

$$v_f = v_i + at$$
$$a = \frac{v_f - v_i}{t} = \frac{140\,\tfrac{m}{s} - 75\,\tfrac{m}{s}}{15\,s} = \boxed{4.3\,\tfrac{m}{s^2}}$$

To solve for "d", you must use the value of "a" determined in part 1.

$$v_f^2 = v_i^2 + 2ad$$
$$d = \frac{v_f^2 - v_i^2}{2a} = \frac{(140\,m/s)^2 - (75\,m/s)^2}{2(4.3\,m/s^2)} = \boxed{1600m}$$

PHYSICSFundamentals
3-14a

Q7: A small ball started moving horizontally at 16.3 m/s. b. This makes sense if we remember the initial velocity as upward. Determine the distance the ball covered in the first 2 seconds. How far above the bottom of the shaft was the nut .25 sec after the fell off.? Find the velocity at t=0 and t=1 sec c. what is the total distance traveled by nut in it motion after the fell off? So here the most suitable formula is $a=\frac {dv}{dt}$ or $a=\frac {d}{dt}(a+2bt+3ct^2)$ $a=2b+6ct$ Substituting t=0 we get $a=2b$ m/s2 Substituting t=1 we get $a=2b+6c$ m/s2 Question 3. e. Q4: If a particle started moving in a straight line with an initial velocity of 25.1 cm/s and a uniform acceleration of 2.4 cm/s2, determine its velocity after 9 seconds. A object is moving along an straight line. Taking upward direction as positive, $-h= \sqrt {gh} t- \frac {1}{2} gt^2$ Where h is negative as we have taken upward as positive axis , t is the time taken taken to reach the ground and acceleration is -g as gravity is active downwards Equation can be written in the form $gt^2-\sqrt {gh} t-2h=0$ Solving this equation and taking positive root $t=2 \sqrt {\frac {h}{g}}$ Question 6. Find out following a.At what height they meet b.what is the time when they meet c.what are the velocities of each object when they meet Solution Let take the origin at the initial position of the object and upward direction as the positive axis. what will the displacement when it comes to rest e. Now Let calculate the nut displacement at t=.25 $H= v_0t+\frac {1}{2}gt^2$ Substituting the values as same above H=.44m Thus the nut was above its starting point. Find the displacement at t=1 sec b. How much time it will take to cover a distance of 1.6km Solution Now first step to attempt such question is to visualize the whole process. At what time, it velocity becomes 20m/sec? So here the most suitable equation is $s=ut+ \frac {1}{2}at^2$ $1600=\frac {1}{2}(2)t^2$ or sec Question 2. Find out the speed and acceleration vector ³ part b. What is the speed at which the ladrÃ ³ n c. Now, since it is uniform movement, we can use the ³ given move rubles in use $v=u+at$ $s=ut+ \frac {1}{2}at^2$ $v^2=u^2+2as$ So of the equation of movement First object $v_1=v_0 - gt$ and $y_1= v_0t- \frac {1}{2}(gt^2)$ â similar for the second object. Â Â Â Â =Â 22/msÂ Ã¨, Â° Â additional question variations for subscribers. Q5: One part, moving in the straight line, accelerated at a speed of 22 cm/s2 in the same direction ³ its initial speed. Find your ³'s ' acceleration and your initial speed 'Â£Â Ã â Â. Q1: When a part moves in the straight line at a constant speed, the magnitude of its acceleration ³ n. "At what height above the bottom of the axle, the nut has zero speed after it falls down? t=1sec Here, by substituting t=1 in the given equation³ we get the answer $x=a(1)+b(1)^2+c(1)^3$ $x=a+b+c$ m b. The ³ equation is given by $x=pt(1-qt)$ Velocity = $\frac {dx}{dt}$ So $v=p(1-2qt)$ Acceleration = $\frac {dv}{dt}$ So $a=-2pqt$ Therefore, Velocity vector= $p(1-2qt) \mathbf{i}$ Acceleration vector=$-2pqt \mathbf{i}$ b. The ³ equation is given by $x=pt(1-qt)$ at t=0,x=0 and $t= \frac {1}{q}$,x=0 AsÃ a t=1/q ,reachÃ its initial position Equation speed ³ $v=p(1-2qt)$ From the equation³ we can see that For $ t < \frac {1}{2q}$, $v>0$ asÃ speed=$|v|= p(1-2qt)$ At $t=\n {1}{2q}$,$v=v 0$ For $t > \frac {1}{2q}$,$v < 0$ so speed=$|v|=p(2qt-1)$ Time Traveled Distance t=0 at t=1/2q $s_1=\int_{0}^{\frac {1}{2q} p(1-2qt)dt = \frac {p}{4q}$ Time Traveled Distance t=1/2q at t=1/q $s_2= \int_{\frac {1}{2}}^{\frac {1}{q} p(2qt -1)dt = \frac {p}{4q}$ AsÃ total distance traveled=$ \frac {p}{4q} + \frac {p}{4q} =\frac {p}{2q}$ 5. The nut hits the bottom of the axis in 2 sec. Discover the following one. We are writing the equation at the same time T variable $ v_2 = V_0 â € "G (T-2) $ and $ Y_2 = V_0 (T-2) â €" \ Frac {1} {2} G (T-2) ^ 2 --- (2) Now when they are, then $ Y_1 = Y_2 $ V_0T- \ Frac {1} {2} (GT ^ 2) = V_0 (T-2) â € "\ Frac {1 } {2} G (T-2) ^ 2 $ Resolvation $ t = \ Frac {V_0} {G} + 1 = 5.09 SEC Substitute this value in any previous equation will give the height value $ H = 40 \ Times 5.09- \ Frac {1} {2} (9.8 \ Times 5.09 \ Times 5.09 \ Times 5.09 \ 5.09) = 76.6 $ m The respective speeds can be found using the first set of each equation 1 and 2 for the first object $ V_1 = V_0 â € "GT = 40- (9.8 \ Times 5.09) = -9.882 $ / sec for the second object $ V_2 = V_0 â €" G (T-2) = 40-9.8 (5.09-2) = 9,718 m / sec question 4. Straight line was moved with a uniform deceleration of 3 m / s2. Then $ v_0 = 3 $ m / sat = 0 and $ A = -G = -9.8 $ m / s2 Now is the time to hit the ground T = 2 so $ H = V_0T + \ Frac {1} {2} GT ^ 2 $ H = 3 \ Times 2 + \ Frac {1} {2} \ Times (-9.8) \ Times 2 \ Times 2 = -13.6 $ m So the lower part of the axis was 13.6 m below When the nut fell off the elevator. A =? Since its initial speed was 60 cm / s, finding the speed of the body when it was 15 m from the starting point. So the total height on the bottom will be = 44 + 13.6 = 14 m c. So the elevator was 13.6 m on the axis when the nut fell from b. Let's also take time t as time started when the first object was thrown up. In this worksheet we will practice the application of the uniform acceleration movement laws of a particle in a straight line. Total distance traveled by nut = .45 + .45 + 13.6 = 14.5m Question 8. This is the actual answer. What is the speed in t = 0, t = 1 b. P9: A particle was moving in a straight line with a constant acceleration of 2 cm / s2. Solución given $ x = - \ Frac {2} {3} T ^ 2 + 16T + 2 $ (1) Speed = $ \ Frac {-4}{3} t+16$ so speed at t=0 =16 and speed at t=1 =$\frac {-4}{3} +16=\frac {4}{3}$ Acceleration ³ is as = $ \ Frac {D ^ 2x} {dt ^ 2} = \ frac {4} {3} $, so the acceleration is independent time and a constant displacement can be found in t = 0, simply replacing the T = 0 values in the equation (1) then, displacement in (t = 0) = 2 now $ v = - \ Frac {4} {3} T + 16 $ When v = 0 then $ t = \ Frac { 4} {3} You can find a $ SEC displacement by replacing the value of t = 4/3 in equation (1) $ =-\ Fraci {32} {27} + \ Frac {64} {3} + 2 $ $ = \ Frac {(-32 + 576 + 54)} {27} = \ Frac {598} {27} {27} {27} {27} {27} {27} The nut fell on the ground? A police motorcycle is moving on a road with a $ v_m $ speed shoots a bullet on the thief motorcycle that accelerates in the same direction with a speed $ V_T (V_T> V_M) $. If the velocity of the muzzle of the bullet is $ V_B (V_B> V_T - V_M) $ Discover the following A. CD execress constant bis and not equal to zero cis scared zero Q2: Determine the time required for a particle to increase its speed of 7 m / sa â €

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